STATEMENT OF JAMES R. MOSELEY
DEPUTY SECRETARY
UNITED STATES DEPARTMENT OF AGRICULTURE
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Mr. Chairman and Members of the Committee, I am pleased to appear before you today to discuss the Department of Agriculture's (USDA) efforts to advance renewable energy and thereby contribute to the energy security of our nation.

My remarks will focus largely on the economics of renewable energy, followed by a brief discussion of USDA programs that promote renewable energy. At the outset, I want to emphasize two underlying themes throughout this discussion: the ongoing role of research, as renewable energy systems are developing technologies, and the overall need for coordination – among federal agencies, as well as government partnerships with the private sector, academia and others – to conduct research effectively.

I also want to stress the strong support of this Administration – as documented in the President's National Energy Policy – for developing renewable energy as part of efforts to increase domestic energy supplies to satisfy America's growing demand for energy. Within this framework, one of USDA's goals is to increase the use of renewable energy. By doing so, we have the potential to create jobs, stimulate economic activity, reduce dependence on foreign oil and cut back on environmental pollution.

USDA is involved in many aspects of renewable energy that contribute to its increased use. Our programs support production of renewable energy. We also support research, development, and pre-commercial work to advance renewable technology and to reduce their costs. USDA also monitors the role of renewable energy in energy markets and U.S. agriculture, and conducts economic analyses that alert us to both roadblocks to greater renewable energy use and opportunities for expansion.

USDA renewable energy activities address an array of energy forms, such as starch and cellulosic ethanol, biodiesel from agricultural oils, biomass, wind and solar, and anaerobic digestion for power.

Economics of Renewable Energy

Ethanol

Ethanol is a renewable energy success story. Currently, seventy-three ethanol plants are operating in 20 states, with a total production capacity of 3.1 billion gallons per year. With 15 ethanol plants now under construction, total production capacity will increase to 3.7 billion gallons per year by early 2005.

Last year, U.S. ethanol producers converted more than 1 billion bushels of corn and sorghum to more than 2.8 billion gallons of ethanol. This was an increase of 680 million gallons – or 32 percent – over 2002. As new plants come on line and as current plants operate at higher levels, we project this

year's production to reach 3.3 billion gallons. In terms of the estimated cost to federal taxpayers, this amounts to $1.1 billion and $1.3 billion in fiscal years 2003 and 2004, respectively. We believe ethanol demand will continue increasing in the United States. Moreover, if the energy bill is passed and the renewable fuels standard implemented, ethanol production will increase to at least 5 billion gallons per year by 2012.

Ethanol demand increased significantly in 2003 when California, New York, and Connecticut replaced methyl tertiary butyl ether (MTBE) in their gasoline with ethanol. More than 900 million gallons of ethanol are required annually to replace MTBE in California and about 450 million gallons are required in New York and Connecticut. With this greater demand, ethanol prices rose to over $1.60 per gallon during November and December 2003. Seventeen states have now banned MTBE in their gasoline, an important factor in ethanol's growth.

In terms of production inputs and expense, corn accounts for 95 percent of feedstock used to produce ethanol. Although corn prices are higher this year, due to a tighter supply/demand balance, these price increases are being offset by higher prices being paid for corn-ethanol byproducts.

One concern ethanol producers have is the rising price of energy. Following corn, fuel – mainly natural gas – is the second largest cost item in producing ethanol. Natural gas prices increased from $2.50 per million British thermal units (Btu) in 1999 to $5.50 per million Btu in 2003, and energy experts expect the price of natural gas to remain high during the next five years. There are no economic

alternatives to natural gas for existing ethanol plants. Using petroleum products instead of natural gas would require additional capital investment and prices for both have been moving together.

Estimates of the energy efficiency of ethanol are the subject of debate. Some studies estimate that there is a net energy loss and an environmental loss from ethanol. Although it takes energy to produce ethanol, we emphasize that repeated USDA studies, using robust corn yields and increasingly efficient fertilizer and alcohol conversion processes, show a positive net-energy balance of corn ethanol: we believe that the energy in ethanol exceeds the amount of energy used to produce it, and that this energy balance has improved over time.

Technological innovations in corn production and ethanol conversion are important factors in this improvement. Corn yields have improved, and ethanol plants are rapidly adopting innovations which substantially reduce the energy required to convert corn into ethanol. Our most recent estimate of the energy ratio is 1.67, up from 1.22 in 1995. This indicates that the energy content of ethanol is 67 percent greater than the energy used to grow, harvest, and transport corn, and to produce and distribute the ethanol. We are estimating similar positive energy ratios for biodiesel.

Research directed at lowering both feedstock and production costs is key to improving ethanol's competitiveness as a fuel or fuel additive. To achieve these cost reductions, USDA research is targeting several areas: the development of organisms that will convert multiple, mixed substrates; superior product recovery and separation technology; high-value co-products; more efficient

technologies and processes for co-product recovery and separation; and better fractionation of feedstocks. We also have scientific work focused on developing varieties of corn that would be easy to mill and provide optimum levels of fermentable substrate and co-products.

Additional Renewable Energy Sources

Turning to other sources of renewable energy, interest in wind power has surged in U.S. energy markets. With technology advances, the cost of electricity from wind power has decreased 80 percent in the past 20 years, according to the Cambridge Energy Research Associates. Some projects reportedly can produce electricity for as low as 3 cents per kilowatt. Over 90 percent of U.S. wind power capacity is concentrated in four states, including Minnesota. While the economics of some installations can compete with traditional power sources, others require assistance. In the short run, a number of factors limit the wind energy market – namely, the unpredictability of wind resources, distance from demand centers, and emerging oversupply of electric power in some regions. We see expanded market potential in the long run, taking into account technological improvements and state renewable energy set-asides.

Biodiesel, as well as lubricants, chemicals, and solvents produced from agricultural fats and oils, offer an opportunity to supplant petroleum derivatives in the coming decade. In the process, "new uses" markets for agricultural fats and oils may expand, giving farmers new outlets for their crops and bringing them into high-volume markets producing high-value nonfood products.

As these markets develop, they have important national policy implications. Because agricultural fats and oils are very energy efficient to produce, our calculations show that their emission of greenhouse gases is much lower than petroleum-based fuels on a net emissions basis. They also represent a sustainable source of domestic liquid transportation fuels.

Selected niche market opportunities for biodiesel are emerging. USDA assessed the life-cycle costs of alternative fuel technologies to determine whether biodiesel is cost competitive for urban bus use. We found that while biodiesel and biodiesel blends have higher total costs than some alternative fuels, they have the potential to compete with compressed natural gas and methanol as fuels for urban transit buses.

The major obstacle to the widespread use of fats and oils for biodiesel manufacture is the relatively high cost of biodiesel from food-grade oils: about $2 per gallon (B 100) compared to $1 per gallon for petroleum diesel on a pre-tax basis. Tallows, yellow and white greases (often termed waste vegetable oil), and true wastes, such as sewage trap grease, are cheaper to use than food-grade oils.

A focused research program is critical to creating economically viable sustainable fuels and chemicals markets based on renewable fats and oils. USDA's research is aimed at lowering the cost of production, optimizing the properties of feedstocks used to produce biodiesel, and developing conversion and utilization technologies which take advantage of the unique properties of the fats and oils.

Biomass crops, such as poplar, willow, and switch grass, have the potential to become important feedstocks for electric power, liquid fuel, and chemical production. They can offer significant environmental benefits over fossil fuels. As long as there is no net energy loss, the energy produced from biomass crops does not add greenhouse gases to the atmosphere during the life cycle of the production and use of the crops.

Analysis by USDA and the Department of Energy (DOE) suggests that, with an aggressive research program aimed at boosting crop yields and developing appropriate power and chemical conversion technologies, biomass might compete with fossil fuels for a broad range of uses. If fossil fuel prices were higher than expected, the biomass industry would be more competitive. A key assumption in our analysis is the development of improved production, harvesting, delivery, and utilization systems. Much hard engineering, organizational, and research work will be required to demonstrate the workability of these systems.

USDA Renewable Energy Activities

USDA has a wide variety of ongoing renewable energy programs. Now, I would like to focus on

what we are doing to implement new authorities provided in the energy title of the Farm Security and Rural Investment Act of 2002 (Farm Bill).

Section 9002, Federal Procurement of Biobased Products, requires federal agencies to increase their procurement of qualifying biobased products. When fully implemented, the program should stimulate development of a broad range of high performing and environmentally friendly biobased products. This section also provides for a voluntary labeling program and use of a "USDA Certified Biobased Product" label. A proposed rule was published in the *Federal Register* on December 19, 2003, and the comment period ended on February 17, 2004. Once we have considered the more than 60 public comments received, a final rule will be published.

Section 9006, Renewable Energy Systems and Energy Efficiency Improvements, authorizes loans, loan guarantees, and grants to farmers, ranchers, and rural small businesses to purchase renewable energy systems and make energy efficiency improvements. We are developing a proposed rule for this program to operate it on a long-term basis.

Last year, we selected 113 applications to receive funding to help develop renewable energy systems, including 35 applications totaling $7.4 million to support wind power; 30 applications totaling $7 million for anaerobic digesters; six totaling $1.1 million for solar, and 16 totaling $3.9 million for ethanol plant/anaerobic digesters, direct combustion, and fuel pellet systems. Minnesota received almost $5 million in grant funding.

Section 9008, Biomass Research and Development Program, provides $14 million for a USDA-DOE solicitation for biomass research and development. We are pleased to be able to work closely with Assistant Secretary Garman and his DOE colleagues to implement this program. Over 400 pre-applications for the joint program have been reviewed and DOE will send out invitations for full applications, which are due by March 26. Final projects will be selected by early May for total grant awards up to $14 million from USDA funding and $10 million from DOE funding. Awards are scheduled to be made by June 1. Two projects from Minnesota were chosen last year in a competitive, merit-based award process. I would like to emphasize that merit-based awards are the best way to ensure that Federal taxpayers get the most for their tax dollars.

Section 9010, the Commodity Credit Corporation (CCC) Bioenergy Program, provides payments to eligible processors to encourage increased purchases of eligible commodities to expand bioenergy production and support new production capacity. For this program year, $150 million is provided in our budget.

I also want to mention that USDA has an ongoing program of research to improve the economics of renewable energy. Our goals are two-fold: to overcome the technical barriers to developing renewable energy, and to strengthen coordination with other federal agencies and with universities, private sector companies, and environmental organizations.

Continued implementation of the Biomass Research and Development Act of 2000 is a key vehicle for improving coordination. The Act creates a structure led by USDA and DOE to coordinate federal biomass research activities and develop more effective plans. I also want to acknowledge the outstanding support DOE has provided USDA in implementing Section 9006 of the Farm Bill. DOE experts were instrumental in helping us evaluate the technical merits of grant applications.

Taken together, our programs, our research, as well as our direction and focus, will help advance agriculture's key role and realize its potential in meeting the demand for clean, affordable renewable energy. It is our conviction that this process will contribute both to the vitality of rural communities and energy stability of our nation.

That completes my statement Mr. Chairman.